

CLAIMS

1. A pump piston assembly comprising:

a) a pump piston having opposing first and second piston ends and having a piston bore extending from the first piston end toward the second piston end;

5 b) a pump check valve disposed proximate the first piston end; and

d) a spring having an attached portion attached to the pump piston proximate the first piston end and having a biasing portion biasing the pump check valve to fluidly block the piston bore, wherein the attached portion is closer to the second piston end than is the biasing portion.

2. The pump piston assembly of claim 1, wherein the pump check valve is a spherical inlet check valve.

3. The pump piston assembly of claim 2, wherein the spring is a conical coil extension spring, wherein the biasing portion of the spring contacts the pump check valve, and wherein the attached portion of the spring has a larger diameter than the biasing portion of the spring.

4. The pump piston assembly of claim 3, wherein the pump piston has a circumferential groove, and wherein the attached portion of the spring has a tang disposed in the circumferential groove.

5. The pump piston assembly of claim 4, wherein the spring has an end coil and an adjacent coil, wherein the end coil has a flat defining the tang, wherein the tang has a free end which overlaps the adjacent coil.

6. The pump piston assembly of claim 5, wherein the pump piston has a circumferential taper contacting the spring between the attached and biasing portions of the spring.

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7. The pump piston assembly of claim 6, wherein the free end of the tang of the end coil of the spring does not overextend the adjacent coil of the spring.

8. The pump piston assembly of claim 3, wherein the pump piston has threads, and wherein the attached portion of the spring is threaded onto the threads.

9. The pump piston assembly of claim 3, also including a clip surrounding the attached portion of the spring and disposed in the circumferential groove of the pump piston.

10. The pump piston assembly of claim 1, wherein the pump piston is a vehicle controlled-breaking-system pump piston.

11. A pump comprising:

a) a pump sleeve having opposing first and second sleeve ends and having a sleeve bore extending from the second sleeve end toward the first sleeve end;

5 b) a pump piston assembly having:

1) a pump piston having opposing first and second piston ends and having a piston bore extending from the first piston end toward the second piston end, wherein the pump piston is slidably engaged in the sleeve bore, wherein the first piston end is disposed inside the sleeve bore, wherein the
10 second piston end is disposed outside the sleeve bore, and wherein the second sleeve end is disposed between the first and second piston ends;

2) a pump check valve disposed proximate the first piston end;

and

3) a spring having an attached portion attached to the pump
15 piston proximate the first piston end and having a biasing portion biasing the pump check valve to fluidly block the piston bore, wherein the attached portion is closer to the second piston end than is the biasing portion.

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~~12~~. The pump of claim 11, wherein the pump check valve is a spherical inlet check valve.

13. The pump of claim 12, wherein the spring is a conical coil extension spring, wherein the biasing portion of the spring contacts the pump check valve, and wherein the attached portion of the spring has a larger diameter than the biasing portion of the spring.

~~14.~~ The pump of claim ~~13~~, wherein the pump piston has a circumferential groove, and wherein the attached portion of the spring has a tang disposed in the circumferential groove.

15. The pump of claim 14, wherein the spring has an end coil and an adjacent coil, wherein the end coil has a flat defining the tang, wherein the tang has a free end which overlaps the adjacent coil.

16. The pump of claim 15, wherein the pump piston has a circumferential taper contacting the spring between the attached and biasing portions of the spring.

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~~17~~. The pump of claim ~~16~~¹⁷, wherein the free end of the tang of the end coil of the spring does not overextend the adjacent coil of the spring.

~~18~~¹⁹. The pump of claim ~~13~~¹⁴, wherein the pump piston has threads, and wherein the attached portion of the spring is threaded onto the threads.

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~~19~~. The pump of claim ¹⁴~~13~~, also including a clip surrounding the attached portion of the spring and disposed in the circumferential groove of the pump piston.

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~~20~~. The pump of claim 11, wherein the pump piston is a vehicle controlled-breaking-system pump piston.

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~~21~~. The pump of claim 12, wherein the pump sleeve has an interior surface portion defining an end of the sleeve bore, and wherein the interior surface portion has a generally convex shape.

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